WR3500-OP-UM-151

WR3500-OPTIONS

1. CHANNEL PRINTER
2. GP-IB CONTROLLER
3. RS-232-C CONTROLLER

INSTRUCTION MANUAL

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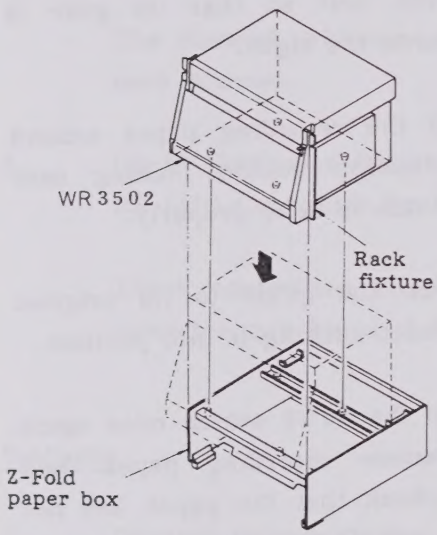
OPTIONS

1 Z-Fold Paper Box

1 – 1 Mounting the Box

When mounting the Z-fold paper box in the WR3500, observe the following precautions. (The figure shows the example of the WR3502.)

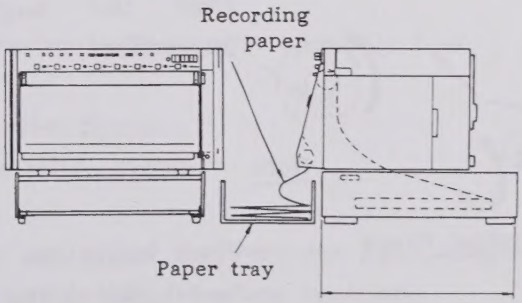


1 Align the box so that it is parallel to the WR3500.

2 Align the box so that its front edge is lined up with the front edge of the WR3500 rack mounting fixture.

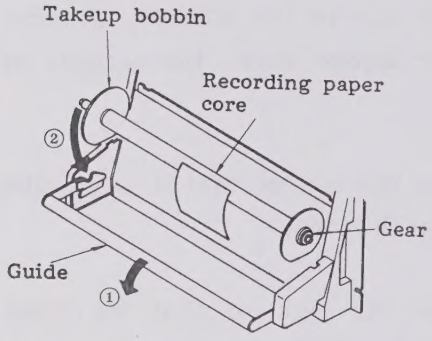
3 Align the box so that its inner surface is lined up with the WR3500's inner surface.

WR3500 Installation Position



2 – 2 Installing Recording Paper

When intalling paper into the takeup unit, always be sure that you press the STOP switch to stop the recording paper feed first and then follow the procedure given below.

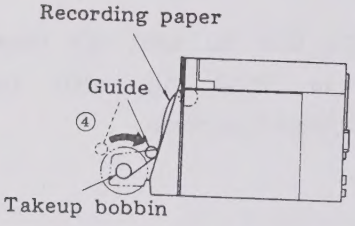


① Open the guide towards the front.

② Set the takeup bobbin into the takeup unit so that its gear is towards the right.

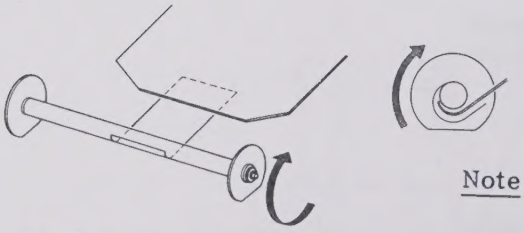
③ Wind the recording paper around the takeup bobbin, taking care that this is done properly.

④ Return the guide to its original attitude, clicking it into position.



Recording Paper Threading

⑤ Press the STOP switch once again to resume recording paper feed and check that the paper has not run off the guide. (If the recording paper is not taken up properly, install the paper again from the beginning of this procedure.)



Winding the Recording Paper

Note

- When using the takeup unit, the feed roller of the mainframe is not used.

We would like to express our appreciation for your purchase of these WR3500 Options. To insure that you get the most from these options we recommend that you read carefully and follow the instructions in this manual.

Outline

1. Channel Printer Option

   The channel printer option provides printing of comments for each channel.

2. GP-IB Controller Option
   RS-232C Controller Option

   These controllers consist of an interface through which a computer may be used to control the recorder.

Features

1. Channel Printer Option

   - o Printing of comments for each channel.
   - o 12-character buffering for channels 1 ∿ 8.

2. GP-IB Controller Option
   RS-232C Controller Option

   - o Enables control of the recorder by a computer having a GP-IB or RS-232C interface function.

- Print strings are sent from the computer to the recorder's internal printer.

- An internal buffer memory is used to store up to 256 bytes of print string.

If the Channel Printer option is purchased, read Section 1. If the Channel Printer option and the GP-IB (RS-232C) Controller option are purchased, read Section 2 as well.

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1. CHANNEL PRINTERS

1.1 Specifications for Mainframe With Additional Printers

Description	o Control of one standard built-in printer o Control of 8 optional printers
Weight	o Approx. 44.3kg (when added to the WR3500-8CH) o Approx. 35.3kg (when added to the WR3502-8CH)
Power consumption	610VA max.
External dimensions (±3mm)	o 483(W) x 540.5(D) x 408.5(H) (when added to WR3500) o 483(W) x 540.5(D)x 266(H) (when added to WR3502)

- o The above specifications apply when the channel printers are mounted to the WR3500(3502).
- o Other specifications are the same as the standard WR3500(3502) mainframe.

1.2 Interface Specifications

8-bit parallel (Centronics)	Functions: o Data transfer method: Asynchronous handshaking transfer using STROBE and BUSY signals. Data format: o ASCII (Numerical data treated as ASCII decimal numbers) Connector used: o 57-40360 (Mainframe side connector)

1.3 Command Descriptions

1.3.1 Commands Issued to the Standard Printer

The six commands shown below are issued to the standard printer and, when input from an external device, are output as is to the standard printer.

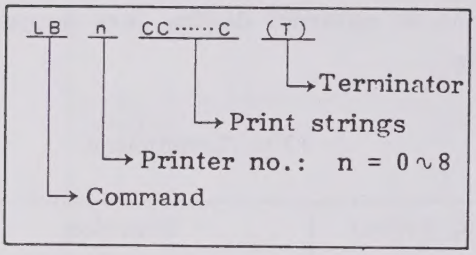
(T): Terminator

Command Name	Command Format	Function
DATE SET	DSYY, MM, DD(T)	Year, month and day setting
TIME SET	TSHH, MM, SS (T)	Hour, minute and second setting
PRINT REPEAT LENGTH	PLn (T)	Printing repetition period setting
PRINT FORMAT	PFnn (T)	Print format setting
DATA NO.	DNnn (T)	Data number setting
DATA NO. UP/DOWN	DMn (T)	Data number count up/down and hold setting

For details refer to the recorder instruction manual.

1.3.2 Accessory Commands

o LB (LABEL) Command



o This command sends a print string to the recorder's built-in standard printer. Printing may be executed, depending upon the mode.

o Input to the buffer is made for the channel printer label.

o Printer No. n

n = 0: The print string is sent to the standard printer. There are 12 print strings.

n = 1∿8: The printers corresponding to each channel are buffered. There are 12 print strings.

NOTE:

If more than 12 data are input, the data in excess of 12 are ignored.

```
10  LPRINT" LB11CH␣500MV/FS " ↵
20  LPRINT" LBØPRINT␣TEST "   ↵
30  LPRINT" LP " ↵
40  END
```

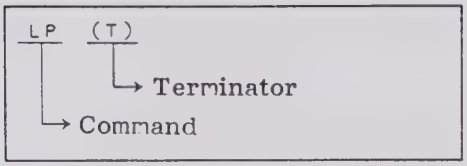
10 Inputs the CH1 printer label "1CH 500MV/FS" to the buffer.

20 Sends the label "PRINT TEST" to the standard printer.

30 Executes printing

40 END

o LP (LABEL PRINT) Command



o Printing is performed by the CH1 ∿ 8 printers.

o The command is sent to the standard printer as a normal command.

Note

When the PR command (described later) is used to set the standard printer mode to N.O. or R.O., it is not possible to send this command to the standard printer.

```
10 LPRINT "LP" ↵
20 END
```

10 Performs printing

20 END

o Precautions When Executing the LB and LP Commands

The channel printer character font is printed using double dots for chart feed speed of 20mm/s and lower and single dots for speeds of 50mm/s or greater, these printing modes being selected automatically. The font is determined by the speed in effect when the LB command is received, so that, after the LB command, if the recording paper feed speed is changed, the character font at the output occurring when the the LP command is executed may be different.

In addition, if the recording paper feed speed is set to 20mm/s or lower, after the LB command is executed, if it is necessary to set the recording paper feed speed to 500mm/s, before changing the speed, the LP command should be executed and character printing completed. After this, the speed can be changed to 500mm/s and the LB or LP command executed.

(Example 1)

If the recording paper feed speed is 20mm/s and the LB command is input after which the feed speed is changed to 100mm/s and the LP command executed, double-dot printing will occur.

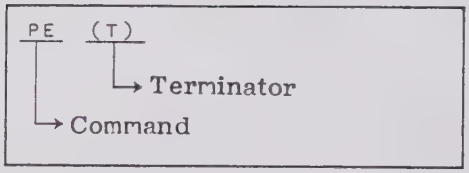
(Example 2)

If recording is performed at 50mm/s and the LB command is input, followed by the LP command, single-dot printing will occur.

o When using the standard printer in the N.O. or R.O. mode, immediately after receiving the LB command, the standard printer begins printing. In the PRINT EXT. mode, printing begins after completion of printing by the printers for channels 1∿8.

1.3.3 Control Commands

o PE (PRINT EXT.) Command



o This command is input to use the standard printer in the PRINT EXT. mode.

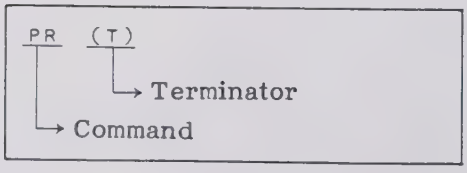
o When the PE command is input, the command input by "LB0$C_1C_2 \ldots C_n$" is sent in the format "LB$C_1C_2 \ldots C_n$". In addition, the LP command is enabled and will be transferred.

```
10  LPRINT"PE" ↵
20  END
```

10 Enables the PRINT EXT. mode.

20 END

o PR (PRINT RESET) Command



- This command is input to use the standard printer in the N.O. or R.O. mode

- When the PR command is input, the command input as "LB0$C_1C_2 \ldots C_n$" is sent in the format "$C_1C_2 \ldots C_n$". The LP command is disabled and will not be transferred.

- In the initialized condition, the PR mode is enabled.

```
10  LPRINT "PR" ↵
20  END
```

10 Cancels the PRINT EXT. mode.

20 END

NOTE

A CR/LF should be input as the terminator (T).

1.4 Interface Functions

8-Bit Parallel Interface

- o Transfer Method

  Asynchronous handshaking is performed using a STROBE and BUSY signal.

- o Electrical Characteristics

  Standard TTL levels are used with logic states as described below.

  Positive Logic ("1" = +2.4V min., "0" = +0.4V max.)

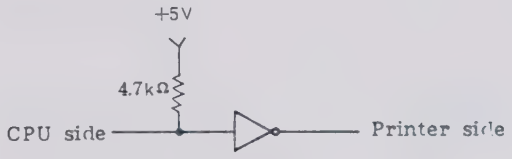
  DATA, BUSY, PAPER END, SELECT, FULL signals

  Negative Logic ("1" = +0.4V min., "0" = +2.4V max.)

  $\overline{\text{ACK}}$, $\overline{\text{FAULT}}$ and $\overline{\text{STROBE}}$ signals

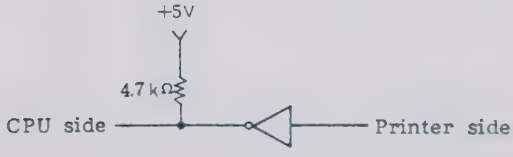
- o Input/Output Interface Circuits

DATA
STROBE



74LS14 or equiv.

BUSY
PAPER END
SELECT
FULL
$\overline{\text{FAULT}}$
$\overline{\text{ACK}}$



74LS14 or equiv.

o Connector Used

57-40360 (DDK) (Mainframe side)

o Connector Pin Arrangement

Pin No.	Signal Name	Direction	Function	Active Level
1	$\overline{\text{DATA STROBE}}$	→ P	Strobe signal used for data writing	L
2	DATA 0	→ P	Input data H = "1", L = "0"	
3	DATA 1	→ P		
4	DATA 2	→ P		
5	DATA 3	→ P		
6	DATA 4	→ P		
7	DATA 5	→ P		
8	DATA 6	→ P		
9	DATA 7	→ P		
10	$\overline{\text{ACKNOWLEDGE}}$	← P	Signal output when data input is completed.	L
11	BUSY	← P	"L" when data may be input and "H" when data input is not possible.	H
12	PAPER END	← P	Indicates that printing on the recorder is not possible. This signal goes high at the paper end and in the HEAT OFF condition.	H
13	SELECT	← P	Always output as high	H
17	FRAME GND	---	Connected to the cabinet	
19∿30	SIGNAL GND	---	Twisted pair return	
32	$\overline{\text{FAULT}}$	← P	Indicates that printing on the recorder is not possible. This signal goes low at the paper end and in the HEAT OFF condition.	L

Pin No.	Signal Name	Direction	Function	Active Level
33	SIGNAL GND	---	Just signal ground	
34	$\overline{\text{FULL}}$	← P	Output as high when the buffer is full or when receipt of data is impossible during data transmission.	H
35	————		Not usable (do not use as a wiring point)	
14, 15, 16, 18, 31, 36	NC		Not used	

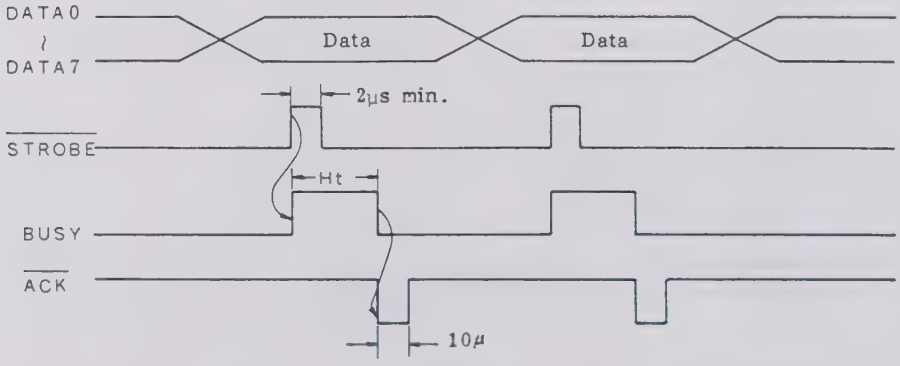
o Data Format

ASCII code: Decimal values (Numerical data are treated as ASCII decimal values.)

o Buffer Memory

One line buffer up to 17 bytes up until the terminator

o Input/Output Timing Chart



NOTE: Ht is indeterminate when BUSY is "1".

2. GP-IB/RS-232C CONTROLLER

2.1 Specifications for Mainframe with Controller

Description	o WR-3500(3502), 1 unit (with external remote control and standard built-in printer control) (Up to 8 optional channel printers may be added)
Recording paper feed speed setting range	1mm/hr ∿500mm/s
Recording paper feed speed signal accuracy	1mm/hr ∿50mm/s: ±0.15% 60mm/s∿ 500mm/s: ±0.5%
Weight	o Approx. 40kg (when added to the WR3500-8CH) o Approx. 31kg (when added to the WR3502-8CH) (Additional 4.6kg added if the channel printers are added.)
Power consumption	430VA max. (610VA max. when the channel printers are added)
External dimensions (±3mm)	o 483(W) x 540.5(D) x 408.5(H) (when added to the WR3500) o 483(W) x 540.5(D) x 266(H) (when added to the WR3502)

- o The above specifications apply when the channel printers are mounted to the WR3500(3502).
- o Other specifications are the same as the standard WR3500(3502) mainframe.

2.2 Interface Specifications

GP-IB	Functions SH: SH-1 RL: RL-0 AH: AH-1 PP: PP-0 T: T-8 DC: DC-1 L: L-3 DT: DT-0 SR: SR-0 C: C-0 Data Format ASCII (numerical data treated as ASCII decimal values) Connector Used 57-20240 (Mainframe side)
RS-232C	Functions o Data transfer method: Half-duplex/stop X parameter handshake function is provided (switch selectable) and RS is always ON (switch selectable) o Data transfer rate: 75, 150, 300, 600, 900, 1200, 2400, 4800, 9600baud (switch selectable) o No. of stopped bits: 1, 1-1/2, 2 bits (switch selectable) o Parity: Even, odd, none (switch selectable) o Data length: 7/8 bits (switch selectable) Data Format o ASCII (numerical data treated as ASCII decimal values) Connector Used DB-25S (Mainframe side)

2.3 Command Descriptions

2.3.1 Commands Issued to the Standard Printer

The six commands shown below are issued to the standard printer and, when input from an external device, are output as is to the standard printer.

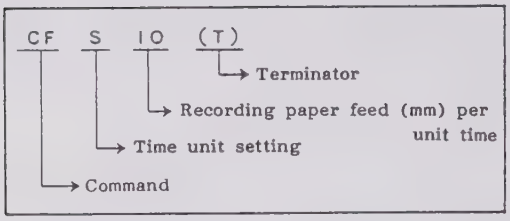
(T): Terminator

Command Name	Command Format	Function
DATE SET	DSYY, MM, DD (T)	Year, month and day setting
TIME SET	TSHH, MM, SS (T)	Hour, minute and second setting
PRINT REPEAT LENGTH	PLn (T)	Printing repetition period setting
PRINT FORMAT	PFnn (T)	Print format setting
DATA NO.	DNnn (T)	Data number setting
DATA NO. UP/DOWN	DMn (T)	Data number count up/down and hold setting

For details refer to the recorder mainframe instruction manual.

2.3.2 Recording Paper Feed Related Commands

o CF (CHART FEED) Command

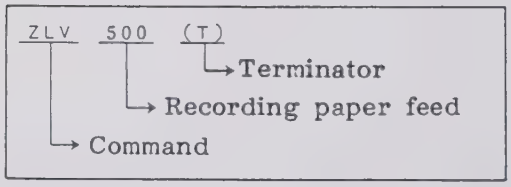


o The recorder's paper feed speed may be set using this command.

o The time unit can be set to S as shown above or to M or H, for minutes or hours respectively, by inputting these characters.

o The recording paper feed per unit time can be set in the range 1mm ∿50mm in 1mm steps.

o ZLV Command



o This command enables high-speed recording paper feed to be set at 60mm/s and above.

o The recording paper feed can be set in the range 60∿500mm in 10mm steps.

```
10  OPEN␣"COM:N81NN"␣FOR
    OUTPUT␣AS␣#1↵
20  PRINT␣#1,"CFS10"↵
30  PRINT␣#1,"FT"↵
40  END↵
```

10 Opens a file.

20 Sets the recording feed speed to 10mm/s.

30 Starts recording paper feed

40 END

OPERATING PRECAUTIONS

When operating the Linearcorder at recording feed speeds of greater than 60mm/s the recording speed is gradually increased using a slow start sequence. Under the conditions 1 through 3 described below, this slow-start is not made and the high-speed signal is input directly. Care is required if this occurs, since the paper feed will not operate and pens may even be damaged.

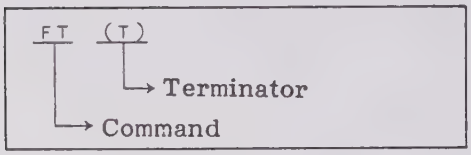
1 In the high-speed paper feed condition, whenever the Linearcorder's EXT switch is operated in the sequence EXT→ INT→ EXT.

2 In the high-speed paper feed condition, whenever the Linearcorder's STOP switch is operated in the sequence OFF→ ON →OFF.

3 When the controller is outputting the high-speed paper feed signal and the connecting cable is connected.

If the operations described above cannot be avoided, initialize the controller (by executing the IN command) before the next operation is attempted.

o FT (FEED START) Command



o After the recording paper feed speed is set using the CF command, the FT command is used to start actual recording paper feed.

o When the FT command is executed, the CF command is always required first.

```
10 OPEN␣"COM:N81NN"␣FOR
   OUTPUT␣AS␣#1↵
20 PRINT␣#1,"CFM50"↵
30 PRINT␣#1,"FT"↵
40 END↵
```

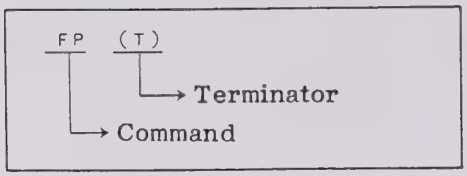
10 Opens a file.

20 Sets the recording paper feed speed to 50mm/min.

30 Starts recording paper feed.

40 END

o FP (FEED STOP) Command



- o This command stops recording paper feed for the recorder whose paper feed has been started using the FT command.
- o If there is output data in the print string buffer, the command is not executed until the buffer is empty.
- o To forcibly stop the paper feed, execute the IN command.

```
10 OPEN␣"COM:N81NN"␣FOR
   OUTPUT␣AS␣#1↵
20 PRINT␣#1,"FP"↵
30 END↵
```

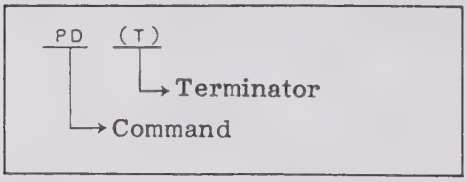
10 Opens a file.

20 Stops recording paper feed.

30 END

2.3.3 Pen Related Commands

o PD (PEN DOWN) Command



o This command places the recorder in the HEAT ON condition.

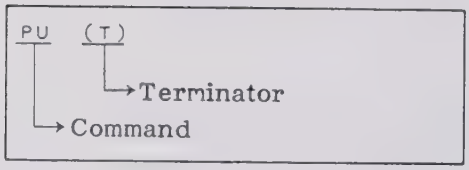
```
10  OPEN␣"COM:N8INN"␣FOR
    OUTPUT␣AS␣#1↵
20  PRINT␣#1,"PD"↵
30  END↵
```

10 Opens a file

20 Sends the PEN DOWN command.

30 END

o PU (PEN UP) Command



o This command enables the HEAT OFF condition if the PD command turns the HEAT ON.

- o If there is output data in the print string buffer, the command is not executed until the buffer is empty.

- o To enable the HEAT OFF forcibly, execute the IN command.

```
10  OPEN␣" COM : N8INN"␣FOR
    OUTPUT␣AS␣#1↵
20  PRINT␣#1, " PU "↵
30  END↵
```

10 Opens a file

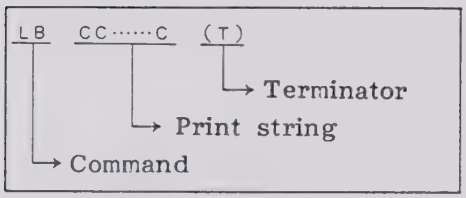
20 Sends the PEN UP command.

30 END

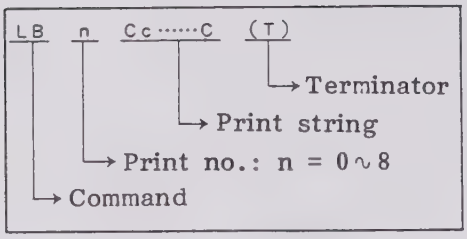
2.3.4 Accessory Commands

- o LB (LABEL) Command

(1) Normal Case



(2) Recorder with Channel Printer(s)



- o After inputting the print string for the recorder's built-in standard printer or channel printer to the print string buffer, it is transmitted and printing is performed according to the selected mode.

- o If there was output data in the print string buffer and the PU or FP command is input, these commands will be held until the buffer is empty of data.

- o The label terminator set by the DT command may be used.

- o The number of print strings is limited to 12.

o Printer number for channel printers.

n = 0: This assignment is made if the print string is to be sent to the standard printer. In this case, there are 12 print strings.

n = 1∿8: This setting sends the string to the printer corresponding to each channel. In this case, there are 12 print strings.

NOTE:

If more than 12 data are input, the data in excess of 12 are ignored.

```
10  OPEN␣"COM:N8INN"␣FOR
    OUTPUT␣AS␣#1↵
20  PRINT␣#1,"PD"↵
30  PRINT␣#1,"CFSIO"↵
40  PRINT␣#1,"FT"↵
50  PRINT␣#1,"LB12345"↵
60  END↵
```

10 Opens a file.

20 Sends the PEN DOWN command.

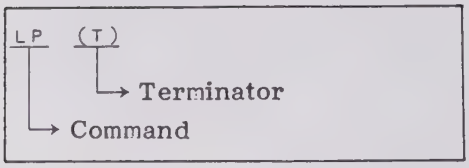
30 Sets the recording paper feed speed to 10mm/s.

40 Starts recording paper feed.

50 Sends the print string "12345".

60 END

o LP (LABEL PRINT) Command



o This command is only valid when the standard printer is to be used in the PRINT EXT. mode and when there are channel printers. After the print string is input to the print string buffer, it is transmitted.

o The PE and PR commands and controller switches (described below) may be set as follows.

1 When the PE command is input and when the controller switches are set up for channel printers, the LP command is enabled and transmission is made.

2 When the PR command is input and the controller switches are set up for no channel printers, the LP command is disabled and transmission is not made. Input will be ignored under these circumstances.

```
10 OPEN␣"COM:N8INN"␣FOR
   OUTPUT␣AS␣#1↵
20 PRINT␣#1,"LP"↵
30 END ↵
```

10 Opens a file.

20 Sends the LABEL PRINT command.

30 END

o Precautions When Executing the LB and LP Commands

The channel printer character font is printed using double dots for chart feed speed of 20mm/s and lower and single dots for speeds of 50mm/s or greater, these printing modes being selected automatically. The font is determined by the speed in effect when the LB command is received, so that, after the LB command, if the recording paper feed speed is changed, the character font at the output occurring when the the LP command is executed may be different.

In addition, if the recording paper feed speed is set to 20mm/s or lower, after the LB command is executed, if it is necessary to set the recording paper feed speed to 500mm/s, before changing the speed, the LP command should be executed and character printing completed. After this, the speed can be changed to 500mm/s and the LB or LP command executed.

(Example 1)

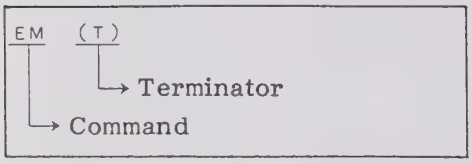
If the recording paper feed speed is 20mm/s and the LB command is input after which the feed speed is changed to 100mm/s and the LP command executed, double-dot printing will occur.

(Example 2)

If recording is performed at 50mm/s and the LB command is input, followed by the LP command, single-dot printing will occur.

- When using the standard printer in the N.O. or R.O. mode, immediately after receiving the LB command, the standard printer begins printing. In the PRINT EXT mode, printing begins after completion of printing by the printers for channels 1∿8.

- EM (EVENT MARK) Command



- The recorder event marker may be set to ON with this command.

  - When the EM command is input, the controller output indicates this condition until the ES command is input.

  - This is valid only when the SP command has been input.

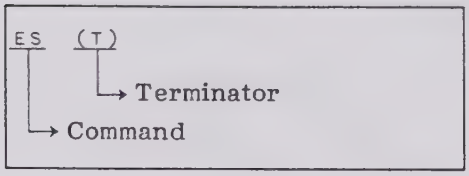
```
10  OPEN␣"COM:N81NN"␣FOR OUTPUT␣AS␣#1↵
20  PRINT␣#1,"EM"↵
30  END↵
```

10 Opens a file.

20 Sets the Event Marker to ON.

30 END

o ES (EVENT SPACE) Command



o This command turns the event marker OFF if it had been turned on using the EM command.

o This command enables the input of the ST command.

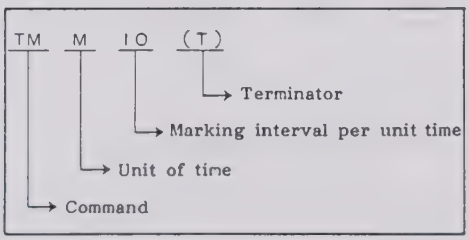
```
10  OPEN␣"COM:N81NN"␣FOR
    OUTPUT␣AS␣#1↵
20  PRINT␣#1,"ES"↵
30  END↵
```

10 Opens a file.

20 Sets the Event Marker to OFF.

30 END

o TM (TIMING MARK) Command



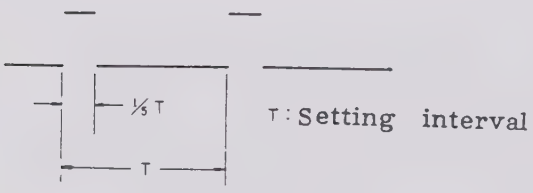
o This command uses the recorder's event marker to write timing marks by using a timing setting.

- The unit of time may be set to M as shown above for minutes or to S for seconds, by inputting the appropriate character.

- The marking interval for unit time has a setting range that depends upon the unit of time as follows.
  Seconds: 10∿60 in steps of 10
  Minutes: 01∿60 in steps of 1

  The parameter must be entered as two digits.

- The timing mark interval is defined as follows.




```
10  OPEN␣" COM: N81NN "␣FOR
    OUTPUT␣AS␣#1 ↵
20  PRINT␣#1, " TMM05 "↵
30  PRINT␣#1, " ST "↵
40  END ↵
```

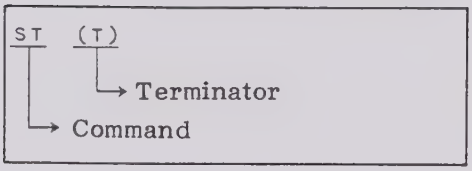
10 Opens a file.

20 Sets the Timing Marker interval to 5 min.

30 Starts the Timing Marker.

40 END

o ST (START TIMER) Command



o This command starts the timing marker at an interval input using the TM command.

o It is operative only when the ES command has been input.

o Immediately prior to the ES command, the TM command must be input (inputting the SP command clears the marking interval).

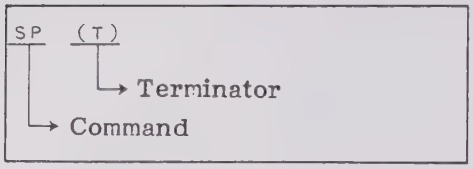
```
10  OPEN␣"COM:N81NN"␣FOR
    OUTPUT␣AS␣#1↵
20  PRINT␣#1,"ST"
30  END↵
```

10 Opens a file.

20 Starts the Timing Marker.

30 END

o SP (TIMER STOP) Command



- o This command stops the timing marker which was started by the ST command.
- o It clears the marking interval which was set by the TM command.
- o This command enables the EM command to be used.

```
10  OPEN␣" COM : N8INN "␣FOR
    OUTPUT␣AS␣#1 ↵
20  PRINT␣#1, " SP "↵
30  END ↵
```

10 Opens a file.

20 Stops the Timing Marker.

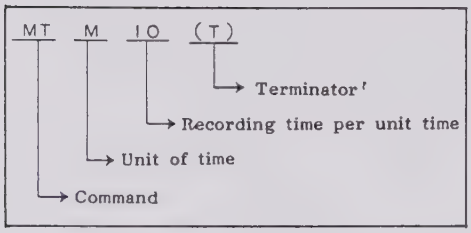
30 END

NOTE

To use the EM and ST commands, the recorder's timing/event marker switch must be switched to EVENT. The EM and ST commands cannot be used simultaneously.

2.3.5 Control Commands

o MT (MEASURING TIME) Command



o This command sets the recording time.

o The unit of time may be set to M or H, for minutes or hours, by inputting the appropriate character.

o The recording time per unit time has a setting range which depends upon the unit of time as follows.
Minutes: 01∿60
Hours: 01∿24

The setting resolution for either mode is 1 and the parameter is input as two digits.

o When the MT command is input, the recorder's operating section and paper feed section stop.

```
10  OPEN␣" COM : N8INN "␣FOR
    OUTPUT␣AS␣#1 ↵
20  PRINT␣#1, " MTM10 "↵
30  PRINT␣#1, " MS "↵
40  END ↵
```

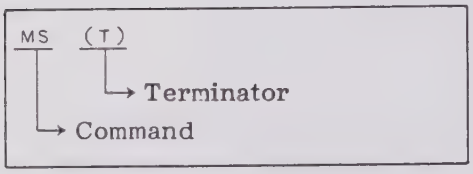
10 Opens a file.

20 Sets the measuring time to 10 min.

30 Starts recording.

40 END

o MS (MEASURING START) Command



o This command starts recording.

o Before the MS command is input, always input the MT command.

o When the MEASURING TIME has elapsed, the recording and recording paper feed operations stop and the recording time set by the MT command is cleared.

o There is no particular command used to interrupt recording. If this is required, however, input the IN command.

```
10  OPEN␣" COM : N8INN "␣FOR
    OUTPUT␣AS␣#1↵
20  PRINT␣#1, "MTMIO "↵
30  PRINT␣#1, "MS "↵
40  END↵
```

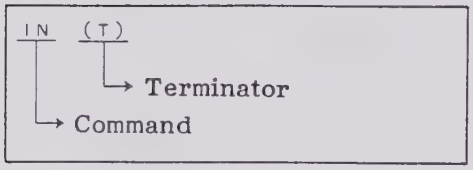
10 Opens a file.

20 Sets the MEASURING TIME to 10min.

30 Starts recording.

40 END

o IN (INITIAL) Command



o This command resets the controller to the condition it is in when power is first applied.

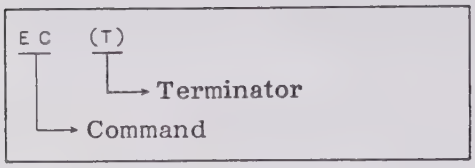
```
10  OPEN␣" COM : N8INN "␣FOR OUT
    PUT␣AS␣#1↵
20  PRINT␣#1, " IN "↵
30  END↵
```

10 Opens a file.

20 Sends the INITIAL command.

30 END

o EC (Error Clear) Command



o This command is used to clear the error bit within the OS command.

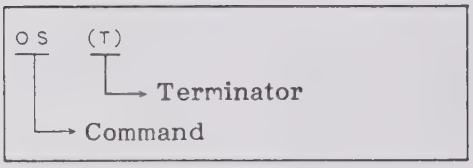
```
10  OPEN␣"COM:E82"␣AS␣#1 ↵
20  PRINT␣#1,"EC" ↵
30  END ↵
```

10 Opens the file

20 Sends the Error Clear command

30 END

o OS (OUTPUT STATUS) Command



o This command outputs the recorder's status to the computer.

o When using GP-IB, verify the addressable status of the MODE switch.

o Output to the computer is made by weighted bits, the total of these bits being output as an ASCII value.

o OS Command Example

If the controller status is PEN DOWN and FEED START, the corresponding weights are as follows.

PEN DOWN = 1 FEED START=16

Thus, 17 (1+16) will be displayed on the computer.

```
10  OPEN␣"COM:E82"␣AS␣#1 ↵
20  PRINT␣#1,"OS" ↵
30  INPUT␣#1,B$ ↵
40  PRINT␣B$ ↵
50  END ↵
```

10 Opens the file

20 Sends the OUTPUT STATUS command

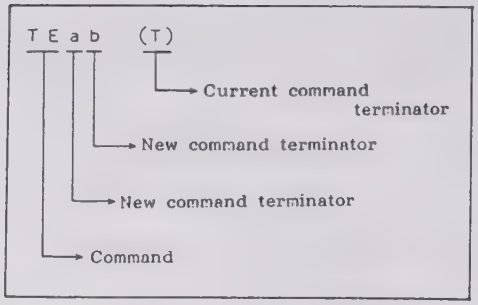
30 Reads B$ from the file

40 Displays B$

50 END

Item	Status	Weight	Meaning
PEN UP/DOWN	DOWN : 1	1	Indicates pen down status
EVENT	ON : 1	2	Indicates event on status
no use		4	Not used
BUFFER FULL	FULL : 1	8	Indicates that the buffer is full
FEED START/STOP	START : 1	16	Indicates the feed start status
ERROR	ERROR : 1	32	Indicates any of the following. o Interface error o Command error o CHART FEED Command specified an out-of-range value. o FF Characters are input o LB Command is input but the printer is not connected.
PAPER END	END : 1	64	Indicates that the recorder PAPER END signal has been input.
no use		128	Not used

o TE (TERMINATOR) Command



- o This command is used to set the terminator for all commands other than the LB command.
- o In the initialized state, CR/LF is set as the terminator.
- o Setting may be made in the ASCII range of 01 ∿ 0E.
- o a = b is also possible.

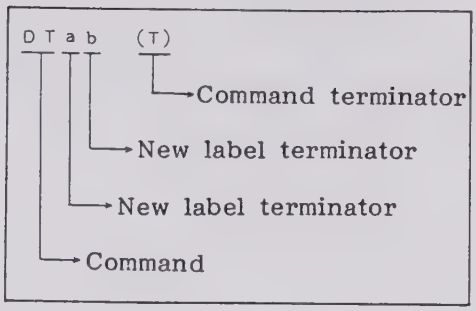
```
10  OPEN␣"COM:E82"␣AS␣#1 ↵
20  PRINT␣#1,"TE"+CHR$(03)+
30  END ↵                  CHR$(03) ↵
```

10 Opens the file

20 Sends $(03)_{16}$, and $(03)_{16}$ as terminator

30 END

o DT (DEFINE TERMINATOR) Command



- o This command is used to set the LB command terminator.
- o In the initialized condition, CR/LF is set.
- o The LB command terminator setting range is 01 ∿ 0E.
- o a = b is also possible.

```
10  OPEN␣"COM:E82"␣AS␣#1 ↵
20  PRINT␣#1,"DT"+CHR$(03)+
                  CHR$(03) ↵
30  PRINT␣#1,"LB1234" ←
40  END ↵          +CHR$(03); ↵
```

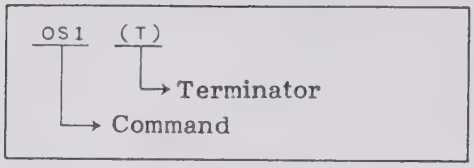
10 Opens the file

20 Sends $(03)_{16}$,$(03)_{16}$ as the label terminator

30 Sends the print string 1234

40 END

o OS1 (OUTPUT STATUS 1) Command

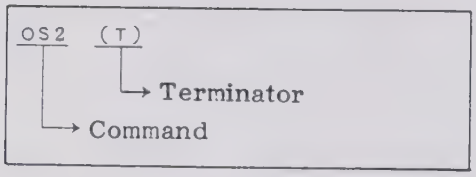


o This command outputs the currently specified chart speed.

OS1 Command Example

If the chart speed had been specified as 10mm/s, "10S" will be displayed on the computer.

o OS2 (OUTPUT STATUS 2) Command



o This command outputs the currently specified timer period.

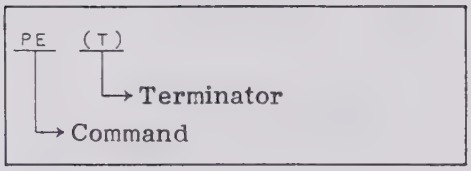
OS2 Command Example

If the timer period had been set to 1 min, "1M" will be displayed on the computer.

NOTE:

If a command error occurs, the characters output by the OS1 and OS2 commands have no meaning.

o PE (PRINT EXT.) Command



o This command is input to use the standard printer in the PRINT EXT. mode.

o When the PE command is input, the command input by "LBXC .. C" is entered into the print string buffer as is and transmitted later.

In addition, the LP command is enabled and transmission is made.

NOTE:

If there are no channel printers, "X" is not required and if there are channel printers, "X" = "0"

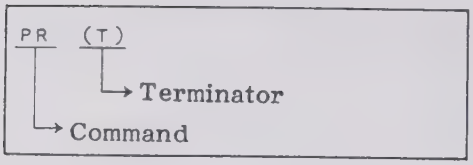
```
10 OPEN␣"COM:N81NN"␣FOR
   OUTPUT␣AS␣#1↵
20 PRINT␣#1,"PE"↵
30 END↵
```

10 Opens a file.

20 Sends the command PRINT EXT.

30 END

o PR (PRINT RESET) Command



- o This command is input to use the standard printer in the N.O. or R.O. mode.
- o When the PR command is input, the command input as "LBXC ... C" is input to the print string buffer in the format "C ... C" and transmitted later.

NOTE:

If there are no channel printers, "X" is not required and if there are channel printers, "X" = "0"

- o In the initialized condition, the PR condition is enabled.

```
10 OPEN␣"COM:N81NN"␣FOR
   OUTPUT␣AS␣#1↵
20 PRINT␣#1,"PR"↵
30 END↵
```

10 Opens a file.

20 Sends the PRINT RESET command.

30 END

NOTES

1. The above program examples use the PC9800 (NEC) RS-232C interface.
2. In the above program examples, ↵ indicates a carriage return.
3. In the above program examples, ␣ indicates a space.

2.4 Interface Functions

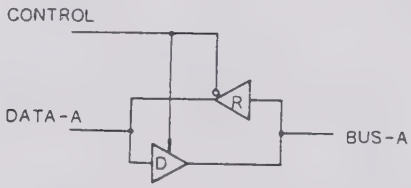
2.4.1 GP-IB Interface

The GP-IB interface consists of a byte-serial, bit-parallel bus line (i.e., over which one byte of data at a time is transferred), and is characterized by three data transfer control lines which perform asynchronous data verification of data transfer between devices connected to the bus. This asynchronous verification technique is known as a three-wire handshake, and constitutes the major feature of the GP-IB standard (IEEE 488).

o GP-IB Configuration

Bus signal		Remarks
Data bus	DIO 1 (Data Input / Output 1) 2 (" 2) 3 (" 3) 4 (" 4) 5 (" 5) 6 (" 6) 7 (" 7) 8 (" 8)	Used to transfer data and interface commands.
Handshake bus	DAV (Data Valid) NRFD (Not Ready For Data) NDAC (Not Data Accepted)	Perform acceptor/ source handshakes
Control bus	ATN (Attention) IFC (Interface Clear) EOI (End or Identify)	Indicates that DIO data is an address or command. Initializes the interface. Indicates the last data byte.

o Electrical Characteristics



75160/160 or equiv.

The logical levels used are standard TTL levels, with the following logic states.

Logical "0": +2.4V or higher
Logical "1": +0.8V or lower

The input/output circuits are as shown in the figure above.

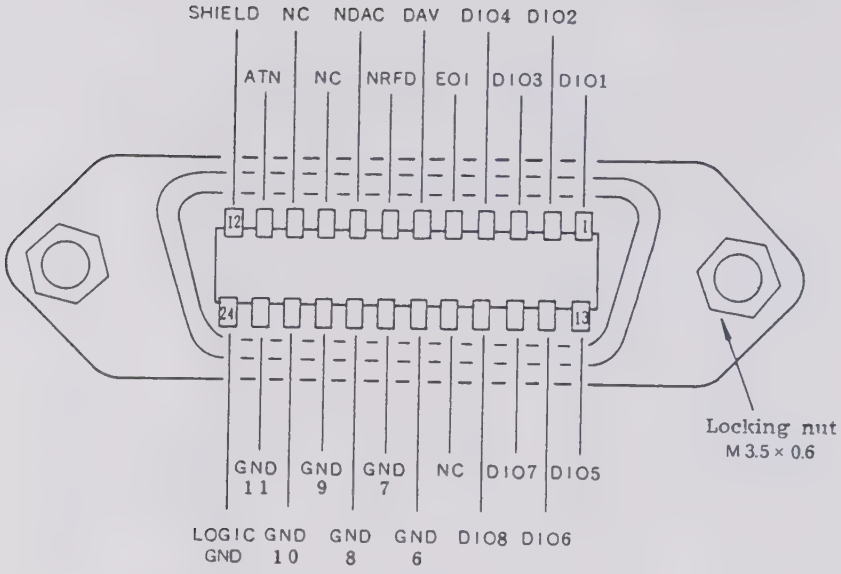
o Connector Used

Mainframe Side: 57-20240 (Daiichi Denshi Kogyo)

o Connector Pin Arrangement

Pin No.	Signal line name	Pin No.	Signal line name
1	DIO 1	13	DIO 5
2	DIO 2	14	DIO 6
3	DIO 3	15	DIO 7
4	DIO 4	16	DIO 8
5	EOI	17	NC
6	DAV	18	GND
7	NRFD	19	GND
8	NDAC	20	GND
9	IFC	21	GND
10	NC	22	GND
11	ATN	23	GND
12	SHIELD	24	LOGIC GND

(Pins indicated with a dashed line use twisted leads)



GP-IB Connector

o Interface Functions

The table below shows the GP-IB interface functions provided.

AH-1	Has receive handshake function.
SH-1	Has send handshake function.
T-8	Has basic talker functions but not talker only function.
L-3	Has basic listener, listen only mode, and listener cancel using MTA (My Talk Address) functions.
SR-0	Has no service request function
RL-0	Has no RL functions.
PP-0	Has no parallel poll function.
DC-1	Has clear all device function.
DT-0	Has no device trigger function.
C-0	Has no controller function.

o Data Format

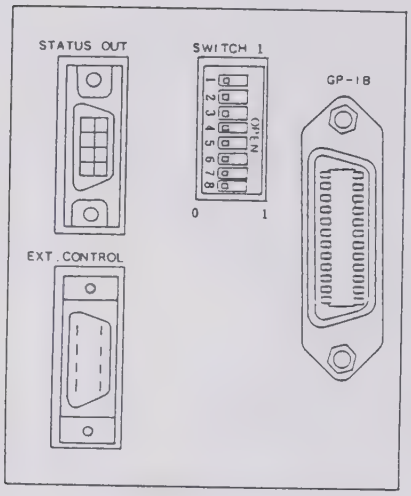
ASCII Format: Decimal (numerical data is treated as ASCII decimal values).

o Buffer Memory

256 Bytes

2.4.2 GP-IB Mode Switch Setting

- Before applying power, the front panel mode switch setting should be made (following the "0" and "1" panel markings).



- Device Address Setting

  The settings 4∿8 are used to set the listen address and talk address of the controller.

- Listen Only Setting

  Setting 3 to "1" enables the listen only mode. Setting this to "0" enables the addressable mode.

- EOI Setting

  Setting 2 to "0" enables EOI (End Of Identify), D_7 should normally be set to "0".

- CH Printer Setting

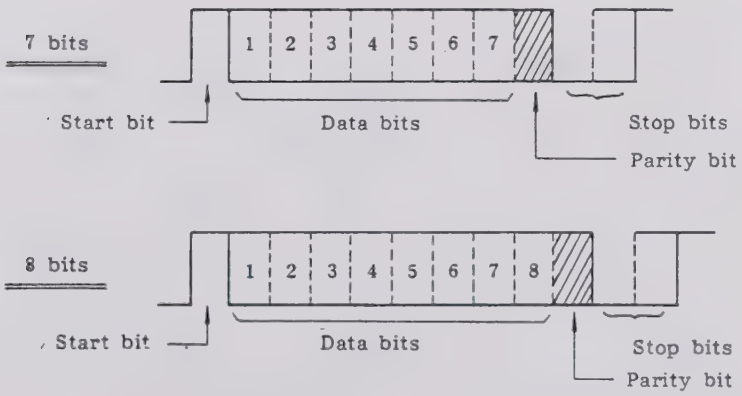
  If channel printers are installed, the number 1 should be set to "1" and if they are not this switch should be set to "0".

1	2	3	4 5 6 7 8
1: CH printer 0: No CH printer	1: Normal 0: EOI	1: LISTEN ONLY 0: Normal	Device address LSB

2.4.3 RS-232C Interface

o General Specifications (EIA RS-232C)

Transfer method	Half-duplex start-stop
Start/stop syncing	An X parameter handshake function is used (switch selectable) and RS is always ON (switch selectable)
Transfer rate	75, 150, 300, 600, 1200, 2400, 4800, 9600 baud (switch selectable)
No. of stop bits	1, 1-1/2, 2 (switch selectable)
Parity	Odd, even, none (switch selectable)
Data length	7 or 8 bits (switch selectable)

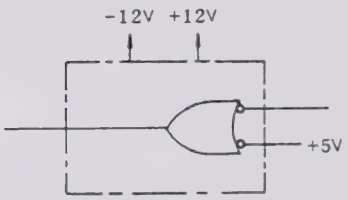


o Electrical Characteristics

		RD,SD (Negative logic)	RS,CS,DR,ER (Positive logic)
Input voltage level	+5 ∿ +12V -5 ∿ -12V	Logical "0" Logical "1"	"ON" "OFF"
Output voltage level	+10V (typ.) -10V (typ.)	Logical "0" Logical "1"	"ON" "OFF"
Load impedance	3 ∿ 7k Ω		

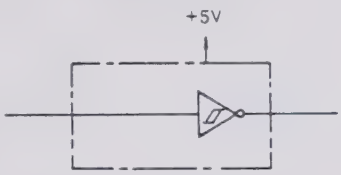
Input/Output Circuits

Driver circuit



75188 or equiv.

Receiver circuit



75189 or equiv.

o Connector Used

Mainframe Side: DB-25S (JAE)

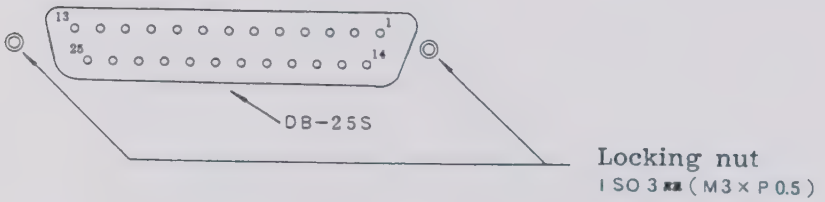
o Connector Pin Arrangement

Pin No.	Signal abbrev.	Signal name	Signal direction	Functional description
1	FG	Safety ground	-	Connected to the controller case.
2	SD	Send data	←C	Data sent from the controller.
3	RD	Receive data	←C	Data input to the controller.
4	RS	Request send	←C	Set ON when the controller is sending. (See notes 4,5)
5	CS	Send enable	→C	When this signal is ON, the controller sends.
6	DR	Data set ready	→C	(See Note 3)
7	SG	Signal ground	-	Connected to the controller signal ground.
(8)	CD	Data channel receive carrier detection	→C	Not used (Open at the controller side, see Note 1)
9				
10	*			
11	*			
12	*			
13	*			(See Note 2)
14	*			
15	*			
16	*			
17	*			
18				
19				

Pin No.	Signal abbrev.	Signal name	Signal direction	Functional description
20	ER	Data terminal ready	←C	On when the controller can receive data. (See Note 5)
21				
(22)	CI	Called identify	→C	Not used (Open at the controller side, see Note 1)
23				
24				
25				

Notes

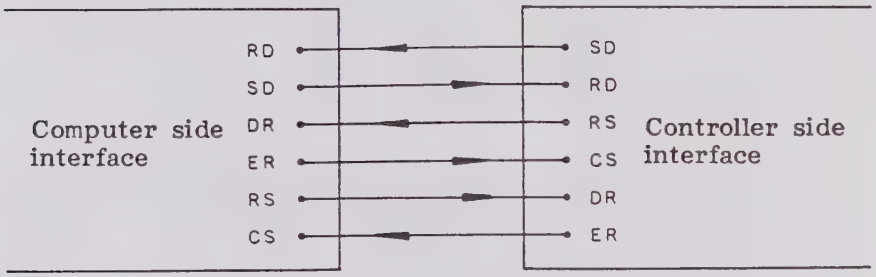
1. Signals for pins in ( ) are ignored by the controller.
2. Signals with abbreviations "*" should not have other signals attached to them.
3. The DR signal is ignored as a standard feature.
4. The RS signal depends upon the mode switch setting.
5. The ER and RS signals are always ON when X ON/X OFF handshaking is selected.



RS-232C Connector

o Standard Connection Method

The method shown below is effective in having a computer read the control signals of the controller.



o Example of transfer from the computer to the controller

Computer side	(CS: On) Data transfer
Controller Side	(ER: On)

o Example of transfer from the controller to the computer

Computer side	(DR: On) (ER: On) (DR: Off)
Controller Side	(RS: On) (CS: On) Data transfer (RS: Off)

Note

If RS is on at the controller side, even if CS has been ON, an error will not occur. Also, if CS is turned OFF during data transfer, transfer will be interrupted.

o Other Connection Methods

Care should be taken as the connection method may depend upon the RS-232C interface functions at the computer.

o X-ON/X-OFF Handshake

The X-ON (DC1) and X-OFF (DC3) characters are used to perform buffer management. When the remaining buffer space is 64 bytes or less, X-OFF is output and when the remaining space is 192 bytes or greater, X-ON is output.

o Data Format

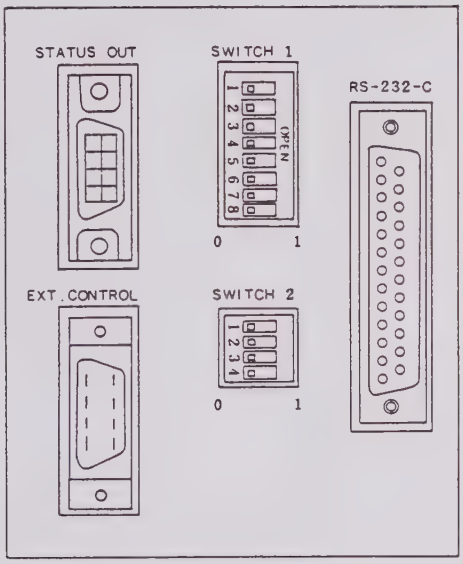
ASCII format (decimal values with numerical data treated as ASCII format decimal numbers).

o Buffer Memory

256 bytes

2.4.4 RS-232C Mode Switch Settings

o Before applying power, the mode switch settings should be made (following the "0" and "1" markings on the panel).



1	2	3	4	5	6	7	8
No. of stop bits		Parity	Parity ON/OFF	Data Length	Baud Rate		

Switch 1

(a) Baud Rate Setting

Bits 6∿8 of Switch 1 are used to set the baud rate. (The baud rate factor is 1/16 for a setting of 9600 baud and 1/64 for other settings.)

Switch / Baud rate	6	7	8
9600	0	0	0
4800	0	0	1
2400	0	1	0
1200	0	1	1
600	1	0	0
300	1	0	1
150	1	1	0
75	1	1	1

Baud Rate Setting

(b) Data Length Settings

Bit 5 of Switch 1 is used to set the data length as 8 bits (1) or 7 bits (0).

(c) Parity Bit ON/OFF Setting

Bit 4 of Switch 1 is used to set the parity bit ON or OFF (On for 1, Off for 0).

(d) Parity Setting

Bit 3 of Switch 1 is used to set the type of parity (Even for 1 and odd for 0).

(e) Number of Stop Bits Setting

Bits 1 and 2 of Switch 1 are used to set the number of stop bits.

Switch / Bit Length	1	2
Invalid	0	0
1	0	1
1-1/2	1	0
2	1	1

Number of Stop Bits Setting

(f) Bit 1 of Switch 2 that is used for X-ON/X-OFF handshake selection. A setting of "1" selects X-ON/X-OFF handshake and a setting of "0" selects normal control line handshaking.

(g) RS Always ON Setting

Bit 2 of Switch 2 establishes whether or not the RS signal is to be on all the time. A setting of "1" keeps it ON and a setting of "0" turns it ON only when transmitting.

1	2	3	4
1: X-ON X-OFF 0: Normal	1: RS always on 0: Normal	CH printer 1: Installed 0: Not installed	Always 1

Switch 2

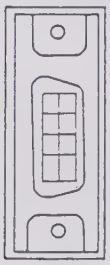
(h) CH Printer Setting

Bit 3 of Switch 2 is used to set the existence or nonexistence of the CH printer. The setting of "1" indicates that the printer exists and a setting of "0" indicates that there is no printer.

(i) Bit 4 of Switch 2 should always be set to "1".

2.4.5 STATUS OUT

STATUS OUT

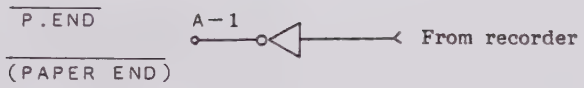


B		A
N.C.	1	$\overline{\text{P.END}}$
T.OUT	2	N.C.
GND	3	N.C.
N.C.	4	N.C.

Viewed from panel

- This is not normally used but can be used when required.
- These status outputs may be used to monitor the status of the recorder.
- When the recorder PAPER END signal and timing marker are used, the corresponding timing relationships are output.

Output Circuits



74LS04 or equiv.

74LS04 or equiv.

- o $\overline{\text{P. END}}$: Goes to low level when the recording paper runs out.

- o T. OUT: A signal is output having the same period as the timing marker.

Connectors Used

Mainframe side: FCN-364J008 (Fujitsu)
Receiving side: FCN-361P008 (Fujitsu)
Cover: FCB-360B008 (Fujitsu)

NOTE

The receiving side connector and cover are not provided and should be purchased separately if required.

2.4.6 Buffer and the Buffer Full Condition

- Since a line buffer is used as the command buffer, each command input must have a terminator ended to it.

- A 256-byte print string buffer is provided.

- When more than 256 bytes of characters are input to the print string buffer, the buffer becomes full and an error flag is set.

  This condition can be examined using the OS command.

- The error flag is reset when the buffer contents drop to 128 bytes.

- When the buffer contents exceed 512 bytes, overlay of the beginning of the print string occurs.

2.4.7 Initialized Condition

- The initialized conditions are as follows.

  - PEN UP
  - EVENT START
  - FEED START
  - Command terminator CR/LF
  - LB Command terminator CR/LF
  - Buffer contents cleared
  - Error flag cleared
  - PRINT RESET
  - Timing marker clear
  - Measuring time clear

2.4.8 Recorder Mainframe Switch Settings

- Set the operating panel switches as follows.

CHART EXT pushbutton switches	EXT
HEAT pushbutton switch	OFF
STOP pushbutton switch	START
PRINT MODE switch	Desired mode
TIMING/EVENT switch	o If using the recorder's internal timer, select the desired timing mode. o When using the EM and TM commands, set the EVENT position.

3. SIMPLE EXAMPLE OF CHANNEL PRINTER USE

3.1 Use of the Recorder Mainframe Printer in the N.O. or R.O. Mode

Procedure

(1) Set the recorder mainframe power to OFF.

(2) Set the mainframe PRINTER MODE switch to N.O. or R.O.

(3) Set the mainframe power to ON.

(4) To print "TEST" on the standard printer, "1CH50V" on the channel 1 printer and "6CH20V" on the channel 6 printer, execute the following program. The standard printer will begin printing immediately after receiving the LB command.

```
10 ␣ LPRINT ␣ "LBOTEST" ↵
20 ␣ LPRINT ␣ "LB11CH50V" ↵
30 ␣ LPRINT ␣ "LB66CH20V" ↵
40 ␣ LPRINT ␣ "LP"
50 ␣ END
```

3.2 Using the Recorder Mainframe Printer in the PRINT EXT. Mode

Procedure

(1) Set the mainframe power to OFF.

(2) Set the mainframe PRINTER MODE switch to the PRINT EXT. position.

(3) Set the mainframe power to ON.

(4) To print "TEST" on the standard printer, "1CH50V" on the channel 1 printer and "5CH10V" on the channel 5 printer, execute the following program. The standard printer will execute printing after the channel printers have completed printing.

```
10 ␣ LPRINT ␣ "PE" ↵
20 ␣ LPRINT ␣ "LBOTEST" ↵
30 ␣ LPRINT ␣ "LB11CH50V" ↵
40 ␣ LPRINT ␣ "LB55CH10V" ↵
50 ␣ LPRINT ␣ "LP" ↵
60 ␣ END
```

3.3 Switching the Mainframe Printing Mode After Power Has Been Switched ON

Procedure

(1) Stop the recording paper feed.

(2) Set the mainframe PRINTER MODE switch to the desired mode.

(3) Restart the recording paper feed.

(4) To print "TEST" on the standard printer, "1CH50V" on the channel 1 printer and "7CH20V" on the channel 7 printer, execute the following program.

```
                    "PE"↵ (When switching to PRINT EXT.
                           from N.O. or R.O.)
10␣LPRINT␣

                    "PR"↵ (When switching to N.O. or R.O.
                           from PRINT EXT.)

20␣LPRINT␣"LB ....."↵

XX␣END
```

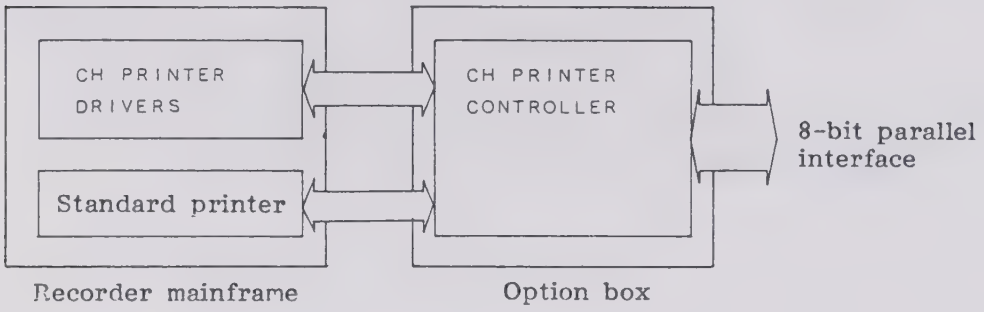
NOTE:

Before the LB or LP command, always input the PE or PR command to switch the printer mode.

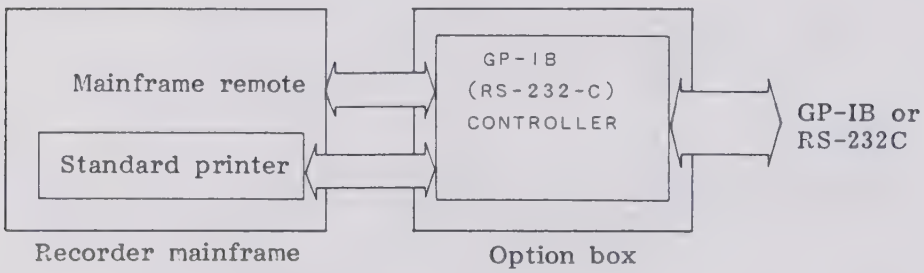
The program example shown is that of printing using the channel printers alone. When using the channel printers in combination with the GP-IB (or RS-232C) controller, the LPRINT statement should be changed to PRINT @1; or PRINT #1.

4. CONNECTIONS BETWEEN THE MAINFRAME AND OPTIONS

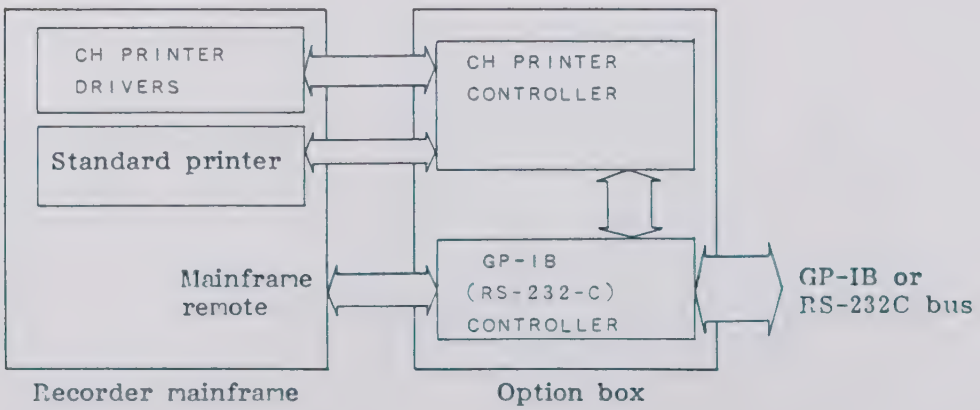
4.1 Connections to Channel Printers



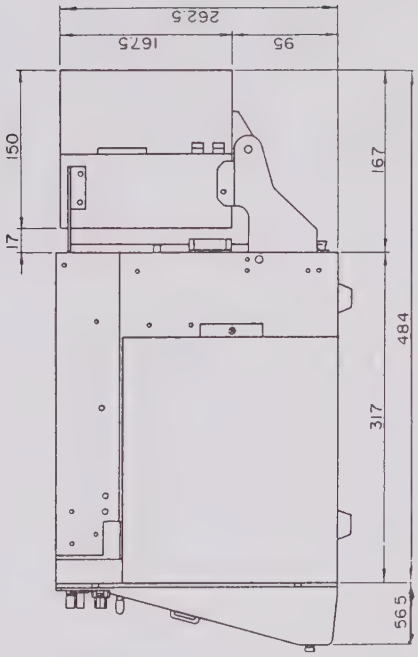
4.2 Connections to the GP-IB (RS-232C) Controller

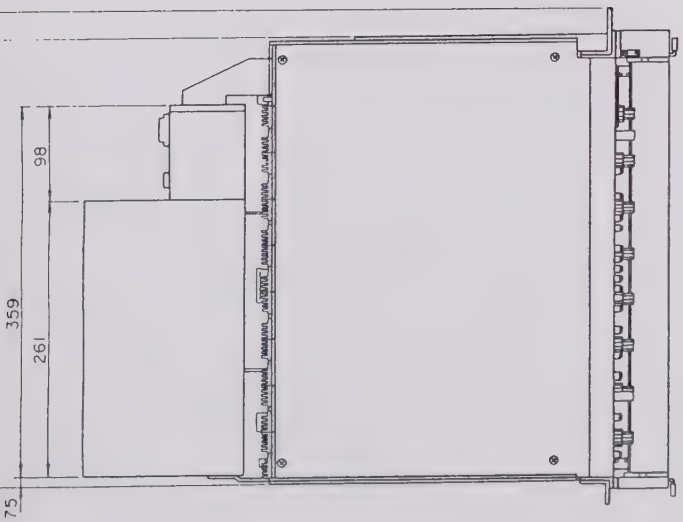


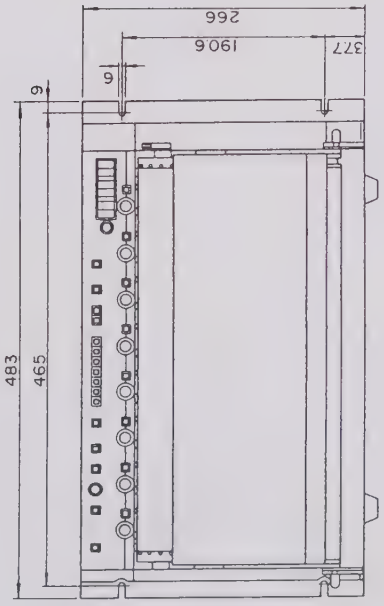
4.3 Connections to the Channel Printers and GP-IB (RS-232C) Controller



5. OUTER VIEWS







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